

Public Perceptions of Domestic Cats and Preferences for Feral Cat Management in the Southeastern United States

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ABSTRACT Populations of feral domestic cats and free-roaming, owned cats have increased throughout the United States, affecting wildlife and public health and warranting attention from a variety of management agencies. The contentious issue of feral cat management requires a greater understanding of public attitudes towards cats and preferences. We used an anonymous internet survey of randomly selected Athens-Clarke County, Georgia households to identify general public perceptions of domestic cats and preferences for cat management. We examined factors that may influence attitudes towards cats, and management including: knowledge about cats, experiences with cats and demographic variables. Results indicate that more residents have positive experiences with feral cats than negative, cat owners have greater knowledge of cats than non-cat owners, and animal welfare or conservation organization membership has a significant effect on attitudes towards cats. A majority of survey respondents agreed that more effective feral cat management is needed yet did not approve of trap-neuter-release (TNR) legislation recently passed in Athens-Clarke County. Logistic regression revealed that residents' attitudes were found to be more important than experiences or knowledge in supporting cat management legislation. Cat sanctuaries were found to be the most acceptable option to reduce feral cat populations (56%), followed by TNR (49%) and capturing and euthanizing cats (44%).

Keywords: domestic cats, feral cat management, public attitudes, public knowledge



The number of feral domestic cats (abandoned, stray, unowned cats) in the United States is estimated to be in the tens of millions, ranging from 70 to 100 million (Jessup 2004; Mott 2004).

Such high population estimates have implications for both wildlife and public health (Barrows 2004; Longcore, Rich and Sullivan 2009), and there is broad interest from community groups, non-profits, and management agencies in reducing cat populations. Biologically effective, yet socially acceptable management for feral cats is a matter of contention in the United States and in many other developed countries (Robertson 2008). Historically, management involved capturing and euthanizing unwanted feral cats at local shelters. A second strategy, growing in popularity throughout the developed world, involves trapping cats, sterilizing them, and releasing cats at the site of capture (trap-neuter-release, TNR). This control method is considered more humane than euthanasia and is promoted by organizations such as Alley Cat Allies, The Best Friends Animal Society, The American Society for the Prevention of Cruelty to Animals (ASPCA), and The Humane Society of the United States (HSUS). Theoretically, cat colonies should decline over time as neutered members are not reproducing. Recently, cities (e.g., Baltimore, Maryland; Athens, Georgia) and the state of Illinois have adopted TNR as their sanctioned method of cat control, though the process remains highly controversial (Longcore, Rich and Sullivan 2009).

Domestic cats are extremely efficient and opportunistic predators and may pose a conservation threat to the birds, herpetofauna, and small mammals that they prey upon (Crooks and Soule 1999; Kays and DeWan 2004; Lepczyk et al. 2004; Nogales et al. 2004; Dauphine and Cooper 2009). Both feral cats and free-roaming, owned cats are especially abundant in urban/suburban areas, generally exceeding densities of like-sized predators by a factor of 10–100 (Liberg et al. 2000) and contributing to extreme predation pressure. While some residents and biologists may harbor concerns about impacts of domestic predators on wildlife and the natural environment, there is also a large group of stakeholders concerned with the welfare of abandoned and feral cats. A few studies report higher disease prevalence among cats living in feral colonies than owned cats (Nutter et al. 2004; Norris et al. 2007). Feral cats are subject to environmental extremes, vehicle trauma, and predation, all of which contribute to high mortality rates (Nassar and Mosier 1982; Warner 1985; Nutter, Levine and Stoskopf 2004) and relatively short life spans (Warner 1985). This has led one animal rights groups to promote euthanasia as the most humane management option (People for the Ethical Treatment of Animals 2009); however, others favor the maintenance of feral cat colonies over any management actions that include lethal control (Alley Cat Allies 2009).

Whereas advocacy groups pressure policy makers to create cat management legislation relevant to their missions, agencies have little information on which management option the general public prefers or about underlying beliefs, knowledge, and experiences that might be related to preferences. A few studies (Ash and Adams 2003; Lord 2008; Loyd and Miller 2010) have investigated the human dimensions behind the issue of feral cat management, but the extent of the research is geographically limited, and general public perceptions of, and knowledge about, cats have not been examined. The controversy over management of feral cats seems to stem from positions of two polarizing groups, the pro-cat advocates (who argue for non-lethal solutions to feral cat overpopulation) and pro-wildlife advocates (who argue for cat removal from the environment as cats are an invasive species detrimental to wildlife) (Williams 2009). Similar disagreements occur regarding responsible pet ownership; many communities debate the common practice of allowing cats to roam free outdoors (Angier 2009). The general public may or may not be as divided as representative wildlife and cat-advocacy organizations.

Prior research has focused on public preference for TNR management. For example, Texas A & M University faculty and staff preferences for cat removal and TNR were almost equally split; respondents were most likely to support feral cat population control in areas where cats were near people, suggesting their primary concerns involved impacts on people (Ash and Adams 2003). Ohio residents who owned cats were more likely (than non-cat owners) to support using tax dollars to fund TNR programs as a method of feral cat control (Lord 2008). Lord (2008) also reported significant differences in beliefs about free-roaming cats according to respondents' type of residential community. A majority of residents for each residential group agreed that TNR would be a good management tool for feral cats (Urban 79%, Suburban 71%, Rural 71%); however, specific preferences for other management strategies (i.e., removal, capture and euthanize) were not investigated (Lord 2008). Loyd and Miller (2010) recently examined predictors of preference for TNR management and found age, gender, and support for wildlife rights to significantly influence public preference for this management option among Illinois homeowners. Lauber et al. (2007) found ethical judgments of those supporting fertility control (TNR) for cats included concern over killing animals to satisfy human interests and protection of the individual cats. In contrast, lethal control is often advocated by people who believe fertility control (TNR) works too slowly (Lauber et al. 2007) or not at all.

Because there is limited information on public attitudes (or specific group attitudes) towards cats and their management, we aimed to investigate this issue in a previously unstudied geographic area (Athens, Georgia), where the controversy over cat management has been the subject of ongoing debate for several years. In April of 2010, after months of public hearings, the Athens-Clarke County Council approved legislation exempting TNR groups from provisions of county animal law (that previously stated that anyone who feeds stray cats are the animals' owners and responsible parties), allowing registration of cat colonies with the county, and providing \$10,000 in vouchers for cat sterilizations. This legislation made TNR the only management option available to Athens' residents since the county cat shelter stopped accepting animals just a few months before.

Because demographic predictors of preference for feral cat management have already been identified (gender, age, residential community size, education level) (Lord 2008; Loyd and Miller 2010), we aimed to explore additional factors (experiences, knowledge of cats, attitudes towards cats) that may help policy makers understand the controversy, the possible influences on public opinion, and more generally, where public opinion falls.

Our research objectives were to:

- 1) Determine Athens-Clarke County residents' perceptions of domestic cats, attitudes towards feral cats, and preferences for management.
- 2) Investigate residents' experiences with, and knowledge of, feral cats.
- 3) Explore relationships between residents' experiences with feral cats and attitudes towards feral cats.
- 4) Explore relationships between residents' knowledge of cats and attitudes towards feral cats.
- 5) Examine attitudes towards, experiences with, and knowledge of domestic cats as predictors of support for TNR legislation.

Methods

Research was conducted in Athens-Clarke County, a consolidated city-county in north-eastern Georgia, USA. Athens-Clarke County is home to the University of Georgia and includes a mixture of urban, suburban, and rural areas.

Questionnaire Design

We used an anonymous internet survey to investigate perceptions of pet cats, preferences for management of feral cats, and to identify public knowledge of cat interactions in the environment. “Feral” cats were defined as stray, unowned domestic cats—they may be somewhat tame strays or completely afraid of people. Free-roaming pet cats were defined as owned cats that are allowed to roam outside without supervision. The survey included four sections of questions to collect information on respondents’: past experiences with cats (7 questions), views about cats and their management (8 questions, some with multiple statements), knowledge about cats (12 statements and 5 concepts), and demographic information. Specific questions about past experiences included questions relevant to: positive experiences with feral cats (feral cat feeding, assistance, and adoption) and negative experiences with cats on the respondent’s property (killing wildlife, urinating or defecating on property). Specific questions about views on cats and their management (attitudes) included: lists of concepts and statements about cats and their management as well as about cats and wildlife and animal rights, questions about perceptions of trends in cat populations, questions about preference for cat management options, and a comparison of acceptable management options for a variety of feral domestic animals and urban wildlife. Responses to the attitude and belief items were recorded using 5-point (1–5) Likert-type scales (Likert 1932).

To assess knowledge of domestic cats, we included a list of statements asking respondents whether they were aware of each fact prior to filling in the questionnaire. Respondents were also asked how comfortable they were with a variety of concepts related to conservation and cat management. Lastly, we asked specific questions about demographics: requesting information on pet ownership, whether respondents allowed their pet cat to roam freely unsupervised, if they have donated to various animal rights, conservation, or cat welfare organizations in the past year, and respondents’ age and gender. The questionnaire was designed by the co-authors and reviewed for bias by social scientists with expertise in the human dimensions of natural resource management. It was pre-tested by a diverse group of 20 volunteers for understanding of wording and content and it took approximately 15 minutes for each to complete it.

Participants and Procedure

Randomly selected Athens-Clarke County households received a mailed postcard requesting participation in the online survey, hosted at www.surveymonkey.com. We acquired mailing addresses via systematic random sampling from the Athens-Clarke County phone book. Each postcard referred to a unique web address meant for the recipient only to enter responses once only. Three thousand postcards were mailed in early May 2010 and nonrespondents received a follow-up postcard request after four weeks.

Forty-two postcards were returned as non-deliverable and 298 total questionnaires were completed by July 1, 2010, giving a response rate of approximately 10%. The sample of 298 responses (from a population of approximately 39, 239 households) provided statistically valid results with a 5.6% margin of error. Sixty-five percent of respondents were female, and

respondents had the following age distribution: 5% were between the ages of 18 and 25, 11% 26–33, 11% 34–41, 11% 42–49, 21% 50–57, 16% 58–65, 10% 66–73, and 7% were above 74 years old.

Statistical Analysis

We used one-way ANOVAs with Tukey's Honestly Significant Difference (HSD) test to compare mean scores on knowledge items and the belief statement "cats do not harm wildlife" by group (cat owner, non-cat owner, birdwatcher, birdwatcher and cat owner). We also used one-way ANOVAs to compare mean responses on several attitude items by group membership (animal welfare, conservation organization member, member of both types and none). Respondents who contributed to animal welfare organizations (i.e., Alley Cat Allies, Best Friends Animal Society, People for the Ethical Treatment of Animals, HSUS, ASPCA) and those who contributed to wildlife/conservation organizations (i.e., The Nature Conservancy, National Audubon Society, The Sierra Club, The World Wildlife Fund, The National Wildlife Federation) were grouped together.

We used ordinal logistic regression to examine whether experiences with cats or total knowledge about cats served as a predictor of various attitude statements about feral cats, including: "feral cats have the right to live in my neighborhood"; "feral cats live healthy, happy lives"; "more effective management of feral cats is needed"; and "free-roaming cats don't harm wildlife."

We conducted binary logistic regression to examine the relationship between support for the TNR legislation in Athens and residents' experiences with cats, attitudes towards feral cat management, and knowledge of domestic cats. We created a global model, including variables from experience, attitudes, and knowledge questions, and four subsequent models hypothesizing relationships about these constructs and support for legislation (Table 1). An "experience" model represented the hypothesis that support for TNR legislation is influenced by positive or negative experiences with feral cats; an "attitudes" model suggested support for TNR legislation is influenced by attitudes towards cats and wildlife; a "knowledge" model examined whether support for TNR legislation is influenced by knowledge of domestic cats, and lastly an "activity" model explored whether support for TNR legislation is influenced by birdwatching and cat ownership (Table 1). To avoid multicollinearity, a series of Pearson chi-square tests were conducted to check for independence among possibly related pairs of variables; thus, only a percentage of many possible predictor variables were included in analysis. We used an information theoretic approach (Burnham and Anderson 2002) to evaluate the plausibility of alternative regression models. A global model was created to predict the influence of all predictor variables on the probability of supporting TNR legislation. To evaluate the global model goodness-of-fit, a Hosmer-Lemeshow test was conducted (Hosmer and Lemeshow 1989). Since the global model adequately fit the data, we assumed subsequent models to be of adequate fit.

We used Akaike's Information Criteria (AIC) (Akaike 1973) to evaluate the relative support of each model. Relative fit was assessed via calculation of Akaike weights (Burnham and Anderson 2002), with the best model having the greatest weight. As the ratio of Akaike weights can be used to assess evidence for one model over another, the confidence set of models included candidate models with the top two Akaike weights. Parameters within the confidence set of models were included in the composite model and inferences within our results were based upon this composite model. Model-averaged estimates of regression coefficients and their standard errors were calculated to incorporate model selection uncertainty.

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Table 1. Hypotheses and associated logistic regression models predicting support for trap-neuter-release (TNR) legislation in Athens-Clarke County, Georgia, USA.

| Hypotheses | Variables in Each Model |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Global Model Support for TNR legislation is influenced by experiences with feral cats, attitudes towards feral cats and their management, knowledge of TNR and domestic cats, cat ownership | Seen feral cat + fed feral cat + feral cat fighting pet + see feral cat kill wildlife + called animal control to complain about feral cat + adopted feral cat + protect wildlife importance + healthy ecosystems importance + cat rights importance + preventing cat euthanasia importance + removing invasives importance + more effective cat management needed + cats don't harm wildlife + total knowledge of cats + knowledge of cats and wildlife + bird-watch + own cat |
| Experience Model Support for TNR legislation is influenced by positive or negative experiences with feral cats | Seen feral cat + fed feral cat + feral cat fighting pet + see feral cat kill wildlife + called animal control to complain about feral cat + adopted feral cat |
| Attitudes Model Support for TNR legislation is influenced by attitudes towards cats and wildlife | Protect wildlife importance + healthy ecosystems importance + cat rights importance + preventing cat euthanasia importance + removing invasives importance + more effective cat management needed + cats don't harm wildlife |
| Knowledge Model Support for TNR Legislation is influenced by knowledge of domestic cats | Total knowledge of cats + knowledge of cats and wildlife + own cat |
| Activity Model Support for TNR legislation is influenced by bird-watching and cat ownership | Bird-watch + own cat |

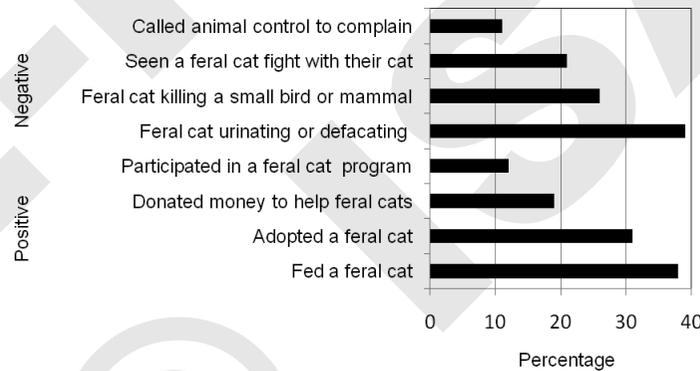


Figure 1. Athens-Clarke County residents' negative and positive experiences with feral cats.

Results

Descriptive Data

Sixty-two percent of respondents had seen a feral cat in their neighborhood in the past 12 months, and 27.6% reported seeing a feral cat almost every day. Forty percent of respondents had at least one positive experience with a feral cat (Figure 1), while 34% had at least one negative experience (Figure 1). Forty-two percent of respondents thought Athens' feral cat population had increased in the past 5 years; 21% of these thought the increase was best explained by a lack of effective cat management, while 34% thought

Table 2. Attitudes of Athens-Clarke County residents to feral cats and their management (percentages reported, $n = 298$).

| Issues | Not At All Important | Slightly Important | Moderately Important | Very Important | Extremely Important |
|------------------------------------------|----------------------|--------------------|----------------------|----------------|---------------------|
| Healthy ecosystems | 0.7 | 1.8 | 5.4 | 36.2 | 55.8 |
| Cat welfare (cats are fed and sheltered) | 22.0 | 16.1 | 23.8 | 20.9 | 17.2 |
| Protecting wildlife | 0.4 | 3.6 | 12.0 | 41.1 | 42.9 |
| Removing non-native, invasive species | 9.3 | 17.5 | 28.6 | 25.7 | 19.0 |
| Supporting animal rights | 6.3 | 11.9 | 24.4 | 30.0 | 27.4 |
| Preventing euthanasia of feral cats | 34.2 | 14.9 | 20.0 | 17.8 | 13.1 |

| Statements | Strongly Disagree | Disagree | Unsure | Agree | Strongly Agree |
|------------------------------------------------------------------|-------------------|----------|--------|-------|----------------|
| I feel that feral cats have the right to live in my neighborhood | 32.1 | 18.1 | 22.7 | 19.9 | 7.2 |
| I worry about problems feral cats might cause for my pets | 10.9 | 18.0 | 12.0 | 36.0 | 23.2 |
| The risk of contracting a disease from a feral cat is low | 18.0 | 24.1 | 30.2 | 22.7 | 5.0 |
| Feral cats should be offered food and shelter | 25.5 | 12.2 | 20.7 | 33.6 | 8.1 |
| Feral cats live healthy, happy lives | 22.1 | 33.7 | 33.3 | 9.8 | 1.1 |
| Non-native species should be removed if they harm native species | 3.6 | 6.9 | 27.3 | 41.5 | 20.7 |
| Feral cats should be managed as non-native species | 11.7 | 18.3 | 36.3 | 20.5 | 13.2 |
| I feel feral cats are a nuisance | 10.5 | 26.1 | 13.0 | 28.3 | 22.1 |
| More effective management of feral cats is needed in Athens | 2.9 | 5.8 | 25.7 | 34.4 | 31.2 |
| Feral cats should be protected and managed as wildlife | 28.7 | 21.8 | 22.9 | 21.1 | 5.5 |
| Pet cats should be allowed to roam free outdoors | 18.8 | 17.9 | 14.0 | 33.7 | 15.8 |
| Free-roaming cats (feral or owned pet cats) do not harm wildlife | 35.1 | 33.0 | 16.5 | 12.2 | 3.2 |
| Euthanizing feral cats is inhumane | 27.9 | 27.5 | 17.5 | 18.2 | 8.9 |
| Pet cats should be kept indoors | 13.2 | 26.3 | 16.4 | 22.1 | 22.1 |

the increase was due to abandonment of cats in the area. Forty-three percent of respondents supported Athens' recent TNR legislation (legalizing feral cat colonies, exempting feral cat caretakers from animal ordinances, and providing funds to support TNR programs), while 57% did not.

Fifty percent of survey respondents agreed that feral cats are a "nuisance," and 65% agreed that more effective management of feral cats is needed in Athens. However, 50% of respondents agreed that pet cats should be allowed to roam outdoors. A majority of respondents (82%) felt that protecting wildlife was very or extremely important, and 57.4% agreed that supporting animal rights was very or extremely important. Interestingly, a minority of respondents (38%) thought feral cat welfare or the prevention of cat euthanasia (31%) was very or extremely important (Table 2). Approximately 30% of respondents were "unsure" about the

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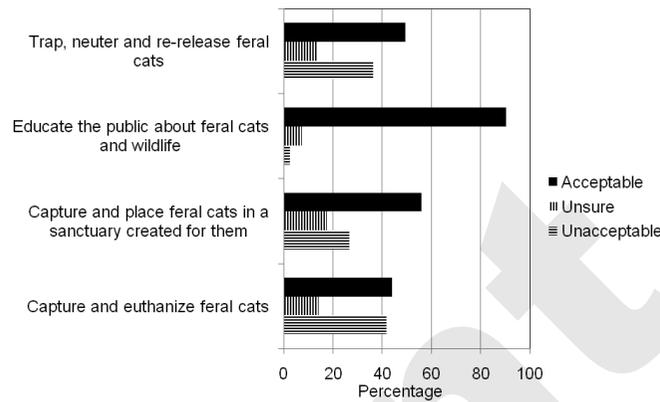


Figure 2. Athens-Clarke County residents' beliefs about the acceptability of potential management options.

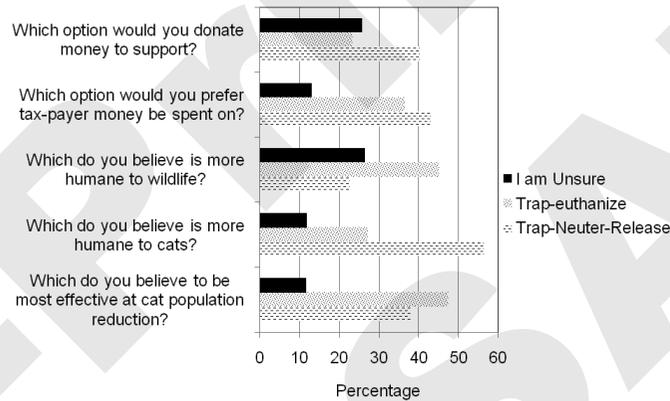


Figure 3. Athens-Clarke County residents' beliefs about alternative feral cat management options.

risk of contracting a disease from a feral cat, as well as whether cats should be managed as a non-native species (Table 2). The majority of respondents (56%) found feral cat sanctuaries to be an acceptable management option, while fewer agreed that TNR (49%) or euthanasia (44%) was an acceptable option (Figure 2). Capturing and euthanizing cats was chosen by most respondents (47%) as more effective population control and more humane to wildlife (45%) than TNR, while a majority (56.3%) found TNR to be a more humane management option for cats than euthanasia (Figure 3). TNR was also the most popular choice of an option for which respondents preferred tax-payer money be spent and which they would donate to support (Figure 3).

Fifty-one percent of respondents were cat owners and 45% of these allowed their pets to roam free outdoors. Sixty-four percent of respondents had done some bird-watching in the past 12 months. Twenty-one percent had donated to an animal welfare organization, and 23% donated to a conservation organization within the past 12 months. Complete descriptive results for attitude items can be found in Table 2; beliefs about management options are summarized in Figures 2 and 3; and knowledge results in Table 3.

Table 3. Athens-Clarke County residents' knowledge about cats (percentages reported, $n = 298$).

| Before Receiving This Survey, Were You Aware That: | | No | Yes |
|-----------------------------------------------------------------------------------------------------|--------------------------|-------------------------------|---------------------------|
| Feral cats are the leading domestic animal carrier of the rabies virus in the US | | 79.1 | 20.9 |
| Indoor cats live significantly longer than outdoor | | 18.1 | 81.9 |
| An unspayed female cat can produce up to 10 kittens every year | | 22.0 | 78.0 |
| Cats can see in the dark | | 10.5 | 89.5 |
| Free-roaming cats will capture prey even if well-fed | | 18.8 | 81.2 |
| Cats are the only animal in which the parasite <i>Toxoplasma gondii</i> can complete its life-cycle | | 75.1 | 24.9 |
| Cats can run up to 30 miles per hour | | 77.6 | 22.4 |
| Cats are the most popular pet in the US | | 64.0 | 36.0 |
| Free-roaming cats can become prey for urban coyotes | | 31.9 | 68.1 |
| Free-roaming cats can contract disease or parasites from wildlife | | 12.8 | 87.2 |
| Outdoor and feral cats will prey upon more small rodents than birds | | 44.6 | 55.4 |
| Concepts | Could Not Explain | Could Somewhat Explain | Could Explain Well |
| How non-native species impact an ecosystem | 22.7 | 54.9 | 22.4 |
| The interactions between cats and wildlife | 20.9 | 57.0 | 22.0 |
| Transmission of toxoplasmosis | 66.9 | 21.1 | 12.0 |
| Causes of songbird decline in the US | 54.3 | 31.9 | 13.8 |
| Trap-Neuter-Release | 7.9 | 49.8 | 42.2 |

Comparisons of Groups

Cat ownership had a significant effect on knowledge about cats: cat owners scored higher than non-cat owners with regards to general knowledge about cats ($F_{(1,295)} = 36.34$, $p = 0.000$, $\chi^2 = 0.1$). Cat owners were also more confident in their ability to explain the interactions between cats and wildlife ($F_{(1,295)} = 6.37$, $p = 0.012$, $\chi^2 = 0.02$). Cat ownership and bird-watching had an effect on beliefs about cats harming wildlife ($F_{(3,275)} = 4.07$, $p = 0.007$, $\chi^2 = 0.04$). Cat owners were more likely to agree or be unsure about whether "free-roaming cats do not harm wildlife" ($M = 2.5$, $SD = 1.1$), while birdwatchers were more likely to disagree with this statement ($M = 1.8$, $SD = 1.2$).

Organization membership (animal welfare, conservation, both, or none) had a significant effect on perceptions of the importance of preventing feral cat euthanasia ($F_{(3,271)} = 5.75$, $p = 0.001$, $\chi^2 = 0.06$) as well as on the belief that feral cats should be offered food and shelter ($F_{(3,267)} = 5.3$, $p = 0.007$, $\chi^2 = 0.06$). Supporters of animal welfare groups evaluated preventing euthanasia as more important ($M = 3.4$, $SD = 1.4$) than did conservation supporters ($M = 2.2$, $SD = 1.3$) or respondents who did not belong to either type of organization ($M = 2.7$, $SD = 1.3$). Supporters of animal welfare groups also had significantly higher mean responses ($M = 3.5$, $SD = 1.2$) regarding perceptions of feral cat welfare than those of conservation supporters ($M = 2.4$, $SD = 1.2$) or respondents who did not belong to either type of organization ($M = 2.9$, $SD = 1.4$). Attitudes about managing feral cats as invasive species were significantly related to group membership ($F_{(3,269)} = 3.81$, $p = 0.011$, $\chi^2 = 0.04$). Conservation supporters ($M = 3.4$, $SD = 1.3$) and respondents without membership in either type of organization ($M = 3.1$, $SD = 1.1$) were more likely to support the management of cats as invasive species than were animal welfare supporters ($M = 2.5$, $SD = 1.1$). Lastly, group membership had a

significant effect on support for TNR management ($F_{(3,275)} = 2.97, p = 0.032, \chi^2 = 0.03$): animal welfare supporters indicated more support for TNR ($M = 3.5, SD = 1.3$) than did conservation supporters ($M = 2.8, SD = 1.5$).

Ordinal Logistic Regression

Respondents with at least one positive experience with feral cats were 4.7 times more likely to agree that feral cats have the right to live in their neighborhood ($\beta = 1.56, SE \beta = 0.24, \text{odds ratio} = 4.7$). The Pearson's chi-square test for goodness-of-fit indicated this was a good model ($\chi^2 = 2.57, p = 0.462$) (null hypothesis is that the model is not a good fit). Respondents with at least one negative experience with feral cats were twice as likely to agree that feral cats are a nuisance ($\beta = 0.725, SE \beta = 0.27, \text{odds ratio} = 2.1$), although the model does not appear to be a good fit ($\chi^2 = 11.74, p = 0.008$). Surprisingly, total knowledge about cats was not a good predictor of attitudes about cat rights ($\beta = -0.03, SE \beta = 0.04, \text{odds ratio} = 1.03, \chi^2 = 37.12, p = 0.849$), belief about whether feral cats live happy, healthy lives ($\beta = 0.14, SE \beta = 0.05, \text{odds ratio} = 1.16, \chi^2 = 45.95, p = 0.514$), belief about whether more effective management of feral cats was needed ($\beta = -0.11, SE \beta = 0.05, \text{odds ratio} = 1.12, \chi^2 = 33.78, p = 0.926$), nor belief about cats harming wildlife ($\beta = 0.12, SE \beta = 0.004, \text{odds ratio} = 1.14, \chi^2 = 59.84, p = 0.099$).

Binary Logistic Regression

Our attitudes model (including importance of protecting wildlife, healthy ecosystems, cat rights, and beliefs about feral cat management and whether feral cats harm wildlife as predictor variables) was the most plausible logistic regression model. This model was just slightly (2%) more probable than the next best model, the global model (Table 4). The composite logistic regression model contained predictor variables from both models in the confidence set.

Table 4. Predictor variables, number of parameters (K), AIC, Δ AIC and Akaike weights (W_i) for the set of models predicting the influence of resident experiences with, and attitudes towards, feral cats on support for trap-neuter-release legislation in Athens-Clarke County, Georgia, USA.

| | K | AIC | Δ AIC | W_i |
|------------------|----|---------|--------------|-------|
| Attitudes Model | 8 | 273.914 | 0.000 | 0.532 |
| Global Model | 18 | 274.176 | 0.262 | 0.467 |
| Experience Model | 7 | 317.515 | 43.601 | 0.000 |
| Activities Model | 3 | 327.587 | 53.672 | 0.000 |
| Knowledge Model | 4 | 328.827 | 54.913 | 0.000 |

AIC = Akaike's Information Criteria.

Beliefs about the importance of protecting wildlife, healthy ecosystems, cat rights, and preventing cat euthanasia had the greatest influence on support for feral cat legislation (Table 5). Respondents who did not think protecting wildlife was important were eight times more likely to support the Athens TNR legislation. Those residents who agreed that cat rights were important were 2.3 times more likely to support the TNR legislation, whereas those disagreeing with the notion that more effective feral cat management is needed were twice as likely to support TNR. In contrast, respondents who did not believe preventing cat euthanasia is important were three times less likely to support TNR, while those uninterested in cat rights were five times less likely to support it. Respondents who agreed that healthy ecosystems were important were

Table 5. Model-averaged parameter estimates, standard errors (SE), confidence intervals (CI), and odds ratios for the composite logistic regression model predicting support for trap-neuter-release legislation in Athens-Clarke County, Georgia, USA.

| Model-Averaged Parameters | Coefficient | Unconditional SE | Upper CI | Lower CI | Odds Ratio |
|---------------------------------------------|-------------|------------------|----------|----------|------------|
| (Intercept) | 1.260 | 0.765 | 2.518 | 0.002 | |
| Protecting wildlife is not important | 2.100 | 1.250 | 4.156 | 0.044 | 8.166 |
| Cat rights are important | 0.822 | 0.487 | 1.623 | 0.021 | 2.275 |
| More effective cat management is not needed | 0.768 | 0.675 | 1.878 | -0.342 | 2.155 |
| Cats harm wildlife | 0.504 | 0.493 | 1.315 | -0.307 | 1.655 |
| Adopted feral cat | 0.308 | 0.266 | 0.746 | -0.130 | 1.361 |
| Preventing cat euthanasia is important | 0.283 | 0.449 | 1.022 | -0.456 | 1.327 |
| Own cat | 0.166 | 0.172 | 0.449 | -0.117 | 1.181 |
| Knowledge of cats and wildlife | 0.063 | 0.058 | 0.160 | -0.033 | 1.065 |
| More effective cat management is needed | 0.058 | 0.389 | 0.698 | -0.582 | 1.060 |
| Total knowledge of cats | 0.009 | 0.027 | 0.054 | -0.036 | 1.009 |
| Bird-watch | -0.007 | 0.119 | 0.188 | -0.203 | 0.993 |
| Protecting wildlife is important | -0.061 | 0.555 | 0.852 | -0.974 | 0.941 |
| Cats don't harm wildlife | -0.081 | 0.593 | 0.894 | -1.057 | 0.922 |
| Seen feral cat fight with pet | -0.105 | 0.188 | 0.204 | -0.414 | 0.900 |
| Seen feral cat kill wildlife | -0.148 | 0.196 | 0.174 | -0.470 | 0.862 |
| Fed feral cat | -0.158 | 0.192 | 0.158 | -0.474 | 0.854 |
| Called animal control about a feral cat | -0.234 | 0.292 | 0.246 | -0.714 | 0.791 |
| Seen feral cat | -0.275 | 0.224 | 0.093 | -0.643 | 0.760 |
| Invasive species should be removed | -0.300 | 0.404 | 0.365 | -0.965 | 0.741 |
| Invasive species should not be removed | -0.912 | 0.467 | -0.144 | -1.680 | 0.402 |
| Preventing cat euthanasia is not important | -1.070 | 0.452 | -0.326 | -1.814 | 0.343 |
| Healthy ecosystems are important | -1.100 | 0.722 | 0.088 | -2.288 | 0.333 |
| Cat rights are not important | -1.570 | 0.438 | -0.849 | -2.291 | 0.208 |
| Healthy ecosystems are not important | -1.650 | 1.630 | 1.031 | -4.331 | 0.192 |

also three times less likely to support the TNR management legislation. Other parameters were less influential and had 90% confidence intervals which included zero (Table 5).

Discussion

Our results indicate that public perceptions of domestic cats in Athens are mixed and corroborate some of the information collected from the general public in other geographic areas (Texas: Ash and Adams 2003; Illinois: Loyd and Miller 2010). Results suggest most Athens residents are very fond of animals, including wildlife, but many perceive feral cats more negatively than their own pet cats. Many agreed that feral cats should be cared for (offered food and water) and that they do not live happy, healthy lives, suggesting the public may not view cats as wild animals. In fact, more than half of the respondents viewed feral cats as a nuisance, though a percentage of these were also cat owners.

In accordance with animal rights orientations reflected in our sample, most respondents preferred the sanctuary management option. A cat sanctuary would protect the welfare of cats, possibly helping them live a happier, healthier life, as well as consider wildlife protection, an item of importance to an overwhelming majority of respondents. Cat sanctuaries may provide a solution for managing smaller cat colonies, and this option should be explored by more cities and non-profit organizations. Cats could be trapped, neutered, and then released only within the boundaries of a fenced sanctuary, where they would be safe from vehicles and coyotes and where wildlife outside the fence is protected. Sanctuary property, fence, and shelter would require a large initial cost, and maintenance and staffing would require a large continued cost; however, many organizations (e.g., Alley Cat Allies), corporations (e.g., PetSmart) and local county and city jurisdictions that donate millions of dollars annually to TNR lobbying and education might contribute financially to a cat sanctuary in addition to standard TNR. Additionally, TNR programs already utilize dozens of dedicated volunteers (Centonze and Levy 2002) who could instead focus their efforts on care and adoption of cats at the sanctuary. Through sanctuary adoption programs, homes can be found for tame cats while semi-tame cats are socialized until they are adoptable. Currently, there are just a few examples of successful sanctuary efforts (Chico Cat Coalition, California; Blind Cat Rescue and Sanctuary, St. Pauls, North Carolina). Before sanctuaries can be promoted as an alternative solution, scientific evaluation of the feasibility of creating and maintaining sanctuaries is recommended.

Twice as many respondents thought TNR was more humane for feral cats than capturing and euthanizing, though many acknowledged this option may not be as effective and that euthanizing feral cats is more beneficial to wildlife (releasing cats into the environment through TNR does not prevent cat predation of wildlife [Guttilla and Stapp 2010]). Results suggest that organization membership (whether the public supports animal welfare organizations or conservation organizations) can provide insight into beliefs about feral cat management. With regards to the “feral cats versus wildlife” debate, several indicators suggest that many respondents appear aware of the impact that cats may have on wildlife, though a proportion are not willing to relinquish the freedom of their own cats to roam and hunt wildlife. Cat owners were more likely to disagree that cats were doing harm to wildlife, even though they may have seen predation events or even received “gifts” of wildlife prey from their hunting pets. Thinking about the issue of cats and wildlife may result in cognitive dissonance among many cat-owning respondents. Generally, respondents appeared fond of both wildlife and cats, suggesting much of the general public may not fall on either side of the polarizing management debates and many may have a hard time deciding which management option to support.

Regression analysis confirmed relationships between experiences with cats and attitudes towards feral cats. This analysis explored whether support for feral cat legislation was most related to experiences, attitudes, or knowledge and found attitudes towards feral cats to be the strongest predictor of support for feral cat legislation. As expected, favorable attitudes towards feral cats were related to support for TNR management. Managers may be able to discern public support for future TNR legislation by considering public attitudes towards feral cats. In Athens, Georgia favorable attitudes towards cats were in a slight minority and while TNR was an acceptable management option to many respondents, a majority of our sample did not support the recent TNR legislation, suggesting it may not be the most ideal option. Because the TNR legislation was eagerly passed by the county council, we predicted a majority of Athens residents would support the bill. Our

results revealed the opposite and suggest that council votes on the subject did not accurately represent public opinion.

General knowledge of domestic cats did not appear to influence beliefs about cats or be a strong predictor of support for management legislation in Athens, yet direct education efforts should still be examined for cognitive and affective impact using a pre-post survey design. Our results suggest there is broad public support for increased education regarding domestic cats and their management. Education should target pet owners (many residents felt the increase in stray cat populations in Athens over the past five years was due to pet abandonment) and should address a number of issues related to feral cats. Almost all respondents supported the idea of increased education about feral cats and wildlife by local managers. Low public awareness of survey items related to cats and disease (rabies, toxoplasmosis) indicates education about the risk of zoonotic diseases posed by feral cats should also be considered.

Study limitations include a lack of information collected from non-respondents, to assess possible non-respondent bias. Non-response bias would introduce an additional source of error in our work. Although our sample size was sufficient to ensure accurate representation of the population, the lack of strong response increases the risk that responses were non-random and may not have been representative of the general public. Some selection bias may occur as a result of using phone-book listings; publicly listed landlines are more commonly used by older residents and thus may limit access to younger residents. Additionally, the survey methodology (postcards requesting residents complete and internet survey) did not prove as successful as repeated paper mailings of questionnaires or telephone interviews. These alternative, yet more costly methods, may have resulted in a higher response rate and even lower error associated with responses. Publicizing the survey in advance or providing incentives for completion may have helped increase our response rate.

Conclusion

Athens' Clarke-County residents' perceptions of domestic cats, and experiences with, and attitudes towards, feral cats were almost equally positive and negative. Opinions were split and general public preferences were not clearly in favor of cat advocacy or wildlife conservation management preferences (TNR, euthanasia). One of the most critical needs to guide management of feral cats has been information on public attitudes towards feral cats and their control. Though our results suggest some new influences on perceptions of cats and preferences for management, this issue warrants further research attention. Public policy decisions are continuing to be made based on inadequate information (Longcore, Rich and Sullivan 2009) and influenced by loud and passionate advocacy groups. General public attitudes towards cats, experiences with feral cats, and preferences for management should be examined across a broader scale. The social aspect of feral cat management is the greatest setback (Lepczyk et al. 2010), such that the highly charged emotions associated with both sides of the issue inhibit progress on actual population reduction. Additional study of public perceptions of feral cats can help local managers make more informed decisions and aid in understanding the growing public debate regarding feral cat management. Furthermore, research into the impact of domestic cats on wildlife as well as the biological efficacy of alternative feral cat management options should be explored. A more solid scientific background would complement this social science research and help managers to focus education efforts.

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